

A Tool for Maintaining Good Combustion

There is a long list of "tools" used by waste-to-energy control room operators to keep the plant operating in accord with regulations. In many plants, the list includes a camera to view inside the furnace. And now, more plants are finding cameras can be useful in several locations within the furnace environment.

By Bill Lang

Good combustion practices became a required part of air quality control systems with waste combustor regulations finalized in 1991. The concept is that increased combustion efficiency helps reduce overall air emissions.

The tools an operator uses to help achieve good combustion are many and varied. They include sophisticated computerized control systems, continuous emission monitoring, and various instruments to ensure such parameters as temperature are residence time are kept within specified ranges.

Among the tools that some waste-to-energy (WTE) plant operators have found helpful are closed-circuit camera/television systems that allow a constant view of conditions inside the furnace. While reliability of fire viewing cameras has been a problem in the past, the technology has advanced dramatically within the past five or six years. The biggest change has been the introduction of industrial units that use electronic charge-coupled devices, technology similar to that used in the popular consumer video cam-corders.

Advancement of this technology has also effectively eliminated many of the problems associated with in-furnace cameras of the past, which relied on vidicon, or vacuum tube, technology. Vacuum tube cameras are subject to a "burn-in" of images from constant viewing into the fire, and thus a slow performance decline in the image beginning with the first day

of operation. The deterioration, in some cases, led to total uselessness after less than a year's service. In plant operations, the result was either a maintenance headache, or operators who quit using the systems altogether.

When a reliable fire viewing system is in place, they can help operators:

- *Achieve maximum burnout of the waste on the grates.* In WTE plants, the heterogeneous or variable nature of the waste stream can lead to situations where a control room operator might want to adjust the waste feed or other furnace controls. One of the operator's objectives is to agitate the trash to get it to burn as cleanly as possible. If the operator sees the fuel clumping up on one side of the grate, he or she can take corrective actions, such as adding supplemental fuel and firing auxiliary burners, or signaling the crane operator to change the mix of the fuel being fed into the furnace charger.

- *Avoid problematic situations that can put equipment or personnel at risk.* For instance, the control room operator might see a propane tank that got past the crane operator. Even if an explosion can't be prevented, anticipating it can allow time for actions to prevent injury and/or minimize damage. Another condition it can help spot is the build-up of slag on boiler tube walls.

- *Help prevent hot spots or overheated situations close to boiler tube walls, thus*



Control room operator views the fire inside two furnaces of the waste-to-energy plant operated by Montanay Power Corp. in Conshohocken, PA.

reducing risk of premature boiler tube failures. A fire view system can help identify burn problems and boiler wall problems before they excessive wear through corrosion or erosion occurs. Boiler tube failures have led to a number of expensive repair and retrofit projects in WTE plants. A notorious case in the early 1990s was the premature failure of boiler tubes at a 2,200-ton-per-day project in New Jersey, less than six months after the project started operation. After an expensive repair, the plant owner/operator installed new fire view camera systems in each boiler that look down into the fire from a point near the superheater. This allows them to keep the fire in the center of the furnace and from impinging on the waterwalls.

Equipment Features

In-furnace camera systems can become a useful, relied upon tool. However, they will become truly useful to the WTE con-

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trol room operators only if they operate trouble free for long periods, and provide clear views into the combustion environment. The following are some key features to consider when evaluating camera systems for waste combustors.

Light volume controls. Select a camera that can be operator-adjusted to changing light conditions—which are constant in a furnace. Manual operation of the camera's iris in the control room (remote from the camera) is also important, since this will allow the operator optimum views of dark or bright areas of the furnaces as they choose. Systems should allow equally good views when looking directly into the most intense fires on the grate and when looking in dark areas, such as where the ash falls off the grate. In some cameras, the brightest fires will cause "whiteout" on the monitor screen, creating a loss of both definition and color in the view.

High-Temperature Design. Waste combustor furnace conditions vary, but they typically reach temperatures of 1,800 to 2,200°F. The unit should be selected to withstand temperatures well above this range. This might include such features as a quartz optical lens, allowing it to operate in environments up to 1,000°F higher than glass lenses can withstand.

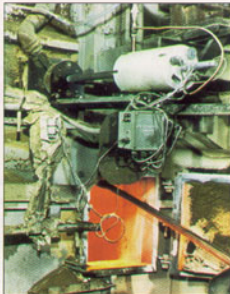
Another item to evaluate is the enclosure for the optical system, which should provide for continual air filtration to keep water vapor, oil and particles out and keeps the lens clean and cool. Because of past concerns about reliability, and the all important rule, *caveat emptor*, plant owners or operators should investigate the warranty and/or the record a company has in standing behind its products.

Experience of Montenay

One operation that has learned to rely on its camera system is the 1,200 ton-per-day WTE plant operated by Montenay Power Corp. in Montgomery County, PA. The plant has used two in-furnace camera units manufactured by Lenox Instruments since the plant began operating in 1992. Each views into the fire at grate level in one of the plant's two furnaces.

Jay Lehr, plant manager, confirms the FireSight™ units have become very important to their shift operators. "If we have a problem with our camera system, we make it a priority item to get it fixed. Our operators don't like doing without them."

"When the fire is right, there is a distinct fire line, and you can see the residue in front of it. If the fire is coming too far down the grate, or its too far back, we know right away we have to make some



Installation of camera and housing in port so view will look across the bottom of the grate.

adjustment," Lehr says.

Lehr reports the plant has had few problems with the cameras, after troubleshooting some early difficulties. The cameras were fogging up or getting cloudy, preventing clear viewing early on. It was moisture in the air within the camera housing. "We originally used in-plant air within the housing. When we switched to supplying the housing with instrument air, we got rid of the fogging problems."

Other Potential Camera Locations

Because of the overall positive experience they have had with the Lenox instruments, Montenay is considering installing cameras at other locations in the boilers at its Montgomery County plant. They are considering installing a camera to view into the ash discharger. In the system that combines fly ash and bottom ash, the lighter-weight fly ash floats and creates a bridge across the discharger. According to Lehr, it presents them with some operational headaches, especially if they have to halt the system temporarily to break up the material jam.

Another place Lehr said Montenay was considering installing a camera is at the top of the furnace, looking down into the fire. With a camera in that location, they might be better able to see if flames are impinging on the waterwalls. The more they prevent those situations, the longer life of the boiler tubes will be. ◆